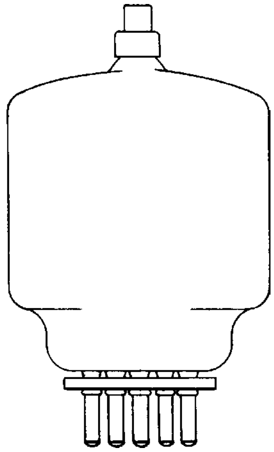


PL3-500ZG Power Triode

The Penta Laboratories PL3-500ZG is a high-mu power triode with a maximum plate dissipation rating of 500 watts. Cooling is by radiation and forced air through the base, along the envelope, and over the plate seal and radiator-type plate connector. It is intended for use as a zero-bias Class AB_2 amplifier in radio-frequency or audio frequency applications. By eliminating the bias supply, zero grid bias operation greatly simplifies circuitry design. When operated in a cathode-driven circuit, a power gain of as much twenty times is achievable.

Electrical Characterisics

Filament		
Voltage	5.0	Volts
Current (E_f=5.0V)	14.6	Amperes
Average Amplification Factor	130	
Direct Interelectrode Capacitances - Grounded Grid		
Input	8.3	pF
Output	4.7	pF
Feedback	0.07	pF
Maximum Frequency for Ratings	110	MHz

Mechanical Characteristics

Base	5 Pin Special	
Net Weight	7.0	Ounces
Maximum Overall Dimensions		
Length	6.10	Inches
Diameter	3.44	Inches
Mounting Position	Vertical, base up or down	
Cooling	Radiation and forced-air	
Recommended Socket	PSK410	

Revised 23 October 2001

P E N T A   L A B O R A T O R I E S
9740 COZYCROFT AVENUE * CHATSWORTH * CALIFORNIA 91311
(800) 421-4219 * (818) 882-3872 * FAX: (818) 882-3968

ELECTRON TUBES FOR INDUSTRY

Application Notes

Cooling

Forced air cooling of the base, base seals, envelope, plate seal, and plate connector is required for all classes of operation when the PL3-500ZG is operated at or near the maximum plate dissipation rating. A total of 14 c.f.m. of cooling air, properly distributed to the base, envelope, and plate seal area is requried. Such cooling is most conveniently provided by means of a pressurized chassis upon which the standard tube socket is mounted in a special cut-out. The use of a glass chimney is advised.

Air at the proper pressure and quantity may be obtained from a small centrifugal blower rated at about 100 c.f.m. of free air. Cooling is adequte when the base seal temperatures do net exceed 200° C and the plate seal temperature does not exceed 225° C. At lower dissipation ratings, it may be possible to operate the PL3-500ZG with less extensive cooling apperatus; however, in all cases, air flow rates in excess of the minimum requirements will tend to prolong the tube's useful life.

Mounting

It is mandatory that the PL3-500ZG be operated in a vertical position, with the base either up or down. Severe shock or vibration will result in damage to the tube, and should be avoided.

Zero-Bias Operation

At plate voltages exceeding 2500 volts, operation at zero bias is not recommended as maximum plate dissipation max be exceeded. A zener diode placing positive bias on the cathode or other fixed voltage source may be used to reduce the zero signal plate current at potentials exceeding 2500 volts.

Class C Operation

Although designed for linear amplifier use, the PL3-500ZG may be operated as a class C power amplifier or oscillator or as a plate modulated RF power amplifier. When operating at plate voltages of below 3000 volts, the zero bias characteristics of the tube can be advantageous.

Input Circuitry

In order to maintain the highest degree of linearity and greatest power output when the PL3-500ZG is used as a grounded grid RF amplifier, the use of a resonant tank in the cathode circuit is advised. With a single ended amplifier, for best results it is recommended that the cathode tank circuit operate at a Q of five or greater.

Typical Operation - Cathode Driven RF Linear Amplifier

Plate Voltage	2500	3500	Vdc
Cathode Voltge	0	+15	Vdc
Zero Signal Plate Current	130	53	mAdc
Single-Tone Plate Current(CW)	400	400	mAdc
Two-Tone Plate Current	280	262	mAdc
Single-Tone Grid Current	120	108	mAdc
Two-Tone Grid Currnet	70	58	mAdc
Single-Tone Power Input	1000	1400	Watts
Useful Output Power (CW or PEP)	600	890	Watts
Resonant Load Impedance	3450	5000	Ohms
Intermodulation Distortion Products			
Third Order	-33	-40	dB
Fifth Order	---	-45	dB
Driving Impedance	100	115	Ohms
Maximum Signal Driving Power	46	46	Watts

Maximum Ratings

DC Plate Voltage	4000	Volts
DC Plate Current	0.4	Amperes
Plate Dissipation	500	Watts
Grid Dissipation	20	Watts

Typical Operation - RF Power Amplifier or Oscillator - Grid Driven

Plate Voltage	3000	3500	Vdc
Grid Voltage	-10	-75	Vdc
Plate Current	350	300	mAdc
Grid Current	115	115	mAdc
Peak RF Grid Voltage	110	187	Volts
Approximate Driving Power	14	22	Watts
Plate Input Power	1050	1050	Watts
Plate Dissipation	330	200	Watts
Useful Output Power	720	850	Watts
Resonant Load Impedance	4200	5700	Ohms

Typical Operation - RF Power Amplifier or Oscillator - Cathode Driven

Plate Voltage	3000	3500	Vdc
Grid Voltage	-10	-75	Vdc
Plate Current	333	350	mAdc
Grid Current	108	118	mAdc
Peak RF Cathode Voltage	95	200	Volts
Approximate Driving Power	35	81	Watts
Plate Input Power	1000	1225	Watts
Plate Dissipation	300	305	Watts
Useful Output Power	700	920	Watts
Resonant Load Impedance	4800	5500	Ohms

Maximum Ratings

DC Plate Voltage	4000	Volts
DC Plate Current	0.35	Amperes
Plate Dissipation	500	Watts
Grid Dissipation	20	Watts

Typical Operation - Plate Modulated Grid Driven RF Power Amplifier

Plate Voltage	3000	Volts
Grid Voltage	-100	Volts
Plate Current	275	mAdc
Grid Current	120	mAdc
Peak RF Grid Voltage	200	Volts
Calculated Driving Power	25	Watts
Plate Input Power	825	Watts
Plate Dissipation	185	Watts
Plate Output Power	640	Watts

Maximum Ratings

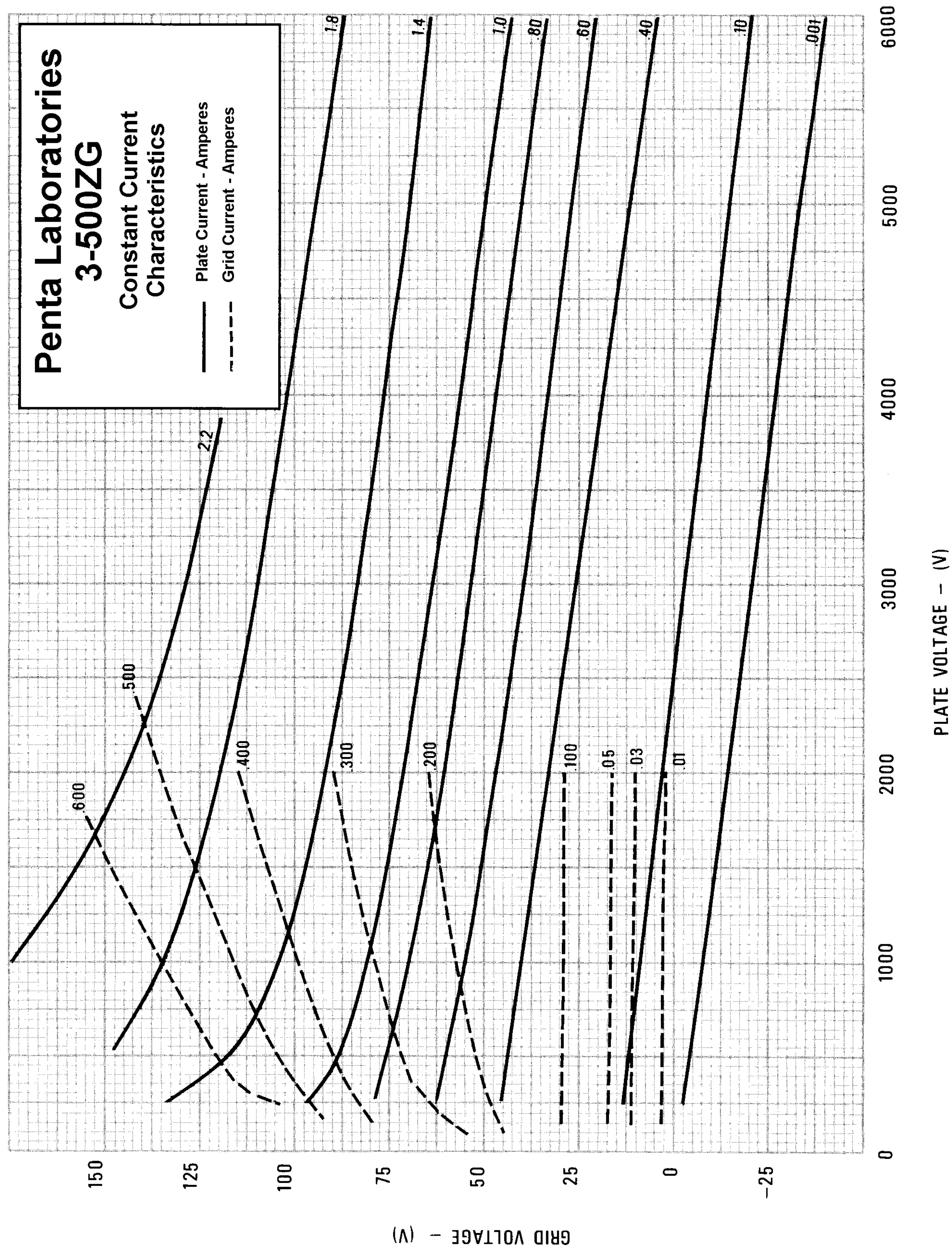
DC Plate Voltage	3000	Volts
DC Plate Current	0.275	Amperes
Plate Dissipation	300	Watts
Grid Dissipation	20	Watts

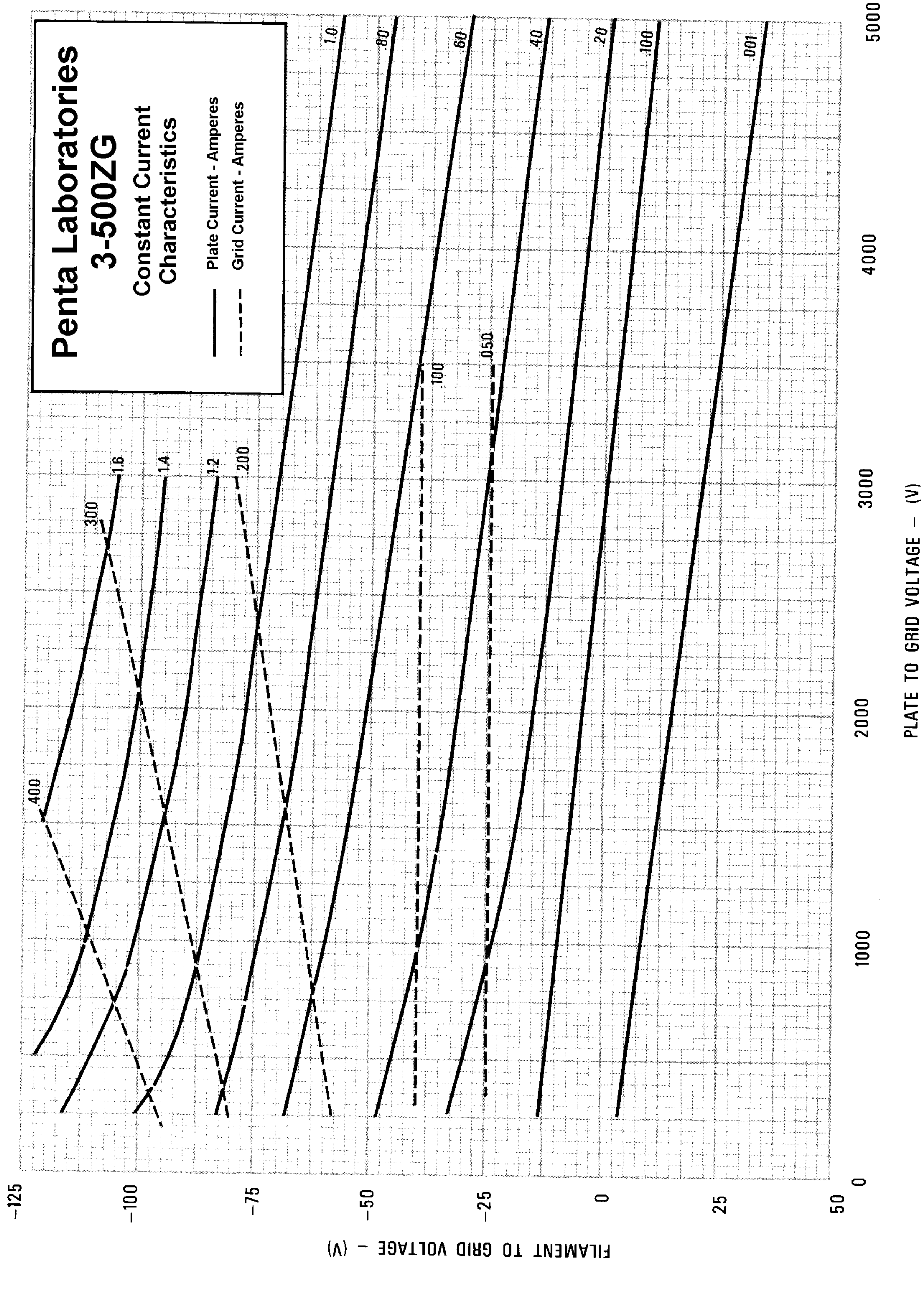
Typical Operation - Audio Frequency Power Amplifier or Modulator - Class AB_2, two tubes

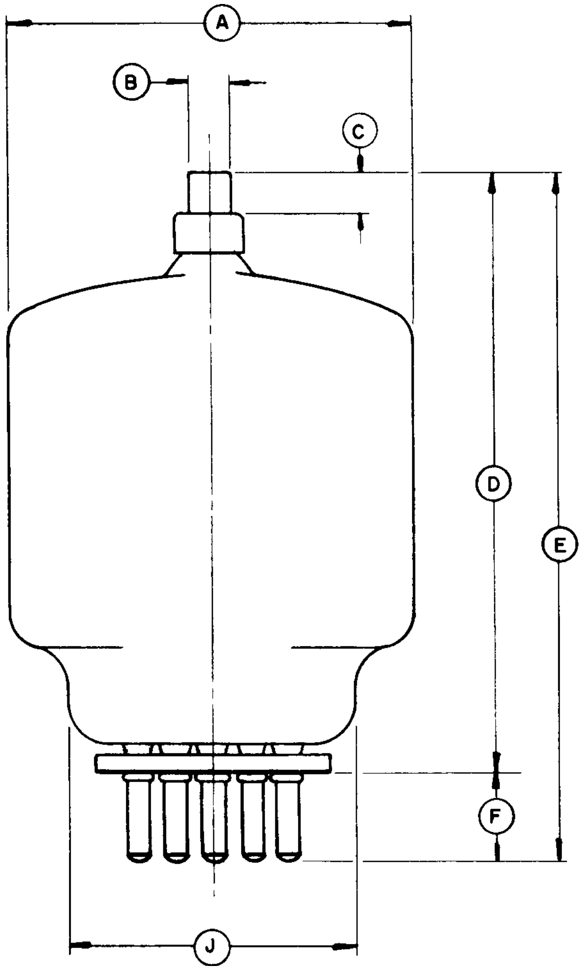
Plate Voltage	3000	Volts
Grid Voltage	0	Volts
Zero-Signal Plate Current	300	mAdc
Maximum Signal Plate Current	770	mAdc
Maximum Signal Grid Current	244	mAdc
Peak F Grid Voltage	100	Volts
Peak Driving Power	25	Watts
Plate Input Power	2310	Watts
Maximum Signal Plate Dissipation	890	Watts
Plate Output Power	1420	Watts
Plate to Plate Load Resistance	8600	Ohms

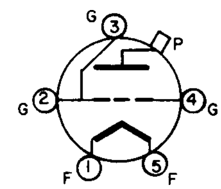
Maximum Ratings (per tube)

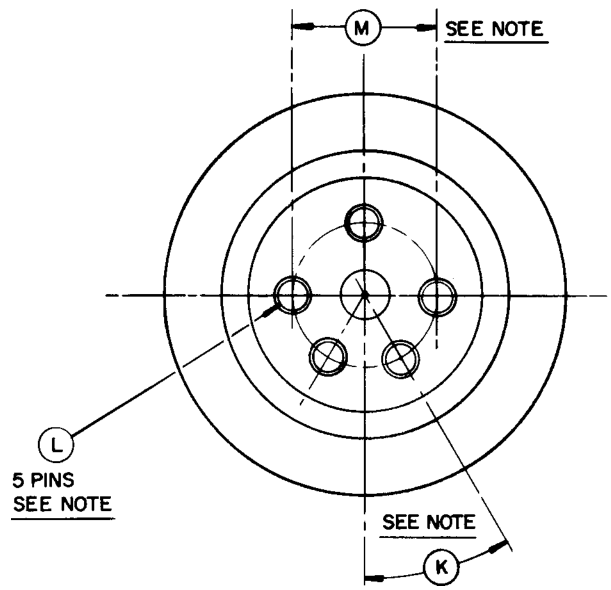
DC Plate Voltage	4000	Volts
DC Plate Current	0.4	Amperes
Plate Dissipation	500	Watts
Grid Dissipation	20	Watts


Penta Laboratories
3-500ZG
Constant Current
Characteristics
Plate Current - Amperes
Grid Current - Amperes
PLATE VOLTAGE — (V)
GRID VOLTAGE — (V)
0
1000
2000
3000
4000
5000
6000
150
125
100
75
50
25
0
-25
2.2
1.8
1.4
1.0
.80
.60
.40
.10
.001
.600
.500
.400
.300
.200
.100
.05
.03
.01


Penta Laboratories
3-500ZG
Constant Current
Characteristics
Plate Current - Amperes
Grid Current - Amperes
1.6
1.4
1.2
1.0
.80
.60
.40
.20
.100
.001
.400
.300
.200
.100
.050
PLATE TO GRID VOLTAGE – (V)
FILAMENT TO GRID VOLTAGE – (V)
0
1000
2000
3000
4000
5000
-125
-100
-75
-50
-25
0
25
50







Dimension Data

	Inches			Millimeteres		
Dim.	Min.	Typ.	Max.	Min.	Typ.	Max.
A	---	---	3.438	---	---	87.33
B	0.350	---	0.365	8.89	---	9.27
C	0.328	---	0.359	8.33	---	9.12
D	---	---	5.200	---	---	132.10
E	5.500	---	6.100	139.70	---	154.94
F	0.700	---	---	17.78	---	---
J	---	---	2.500	---	---	63.50
K	---	30°	---	---	---	---
L	0.1875	---	0.191	4.70	---	4.85
M	---	1.250	---	---	31.75	---

Note: pins "L" are so aligned that they can be freely inserted into a gage 1/4" thick with hole dias. of 0.204 located on true centers by the given dims "K" and "M".